

In re Patent Application of:
STORM ET AL.
Serial No. 10/820,464
Filed: **APRIL 8, 2004**

In the Claims:

Claims 1-13 (Cancelled).

14. (Currently Amended) An image sensor comprising:
an array of pixels, each pixel comprising

a photodiode,

a first output circuit for deriving a linear
output signal by applying a reset signal to said
photodiode and reading a voltage on said photodiode
after an integration time, said first output circuit
comprising

a reset switch for applying the reset
voltage to said photodiode, said reset switch
comprising a reset transistor including a
conducting terminal connected to said photodiode,
and

a readout switch for turning on the
conducting terminal of said reset transistor after
expiration of the integration time, said readout
switch comprising a readout transistor including a
conducting terminal connected to the conducting
terminal of said reset transistor, and including a
control terminal,

a second output circuit for deriving a logarithmic
output signal by reading a near instantaneous
illumination-dependent voltage on said photodiode that
is a logarithmic function of the illumination, said

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second output circuit comprising

an amplifier including an output and at least one input connected to the conducting terminal of said reset transistor, and

a log select switch for connecting said amplifier to said photodiode, said log select switch comprising a log select transistor including a pair of conducting terminals connected between the output of said amplifier and the control terminal of said readout transistor at least one input of said amplifier, and including a control terminal to receive a log select signal, and

said first and second output circuits sequentially providing the linear and logarithmic output signals; and

an output selection circuit coupled to said array of pixels for selecting between the linear output signal and the logarithmic output signal as an output signal.

Claims 15 and 16 (Cancelled).

17. (Previously Presented) The image sensor according to Claim 14, wherein said amplifier comprises a differential amplifier so that the at least one input includes an inverting input connected to the conducting terminal of said reset transistor, and a non-inverting input connected to a reference voltage.

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18. (Previously Presented) The image sensor according to Claim 14, further comprising a calibration circuit for calibrating each pixel before deriving the logarithmic output signal.

19. (Previously Presented) The image sensor according to Claim 18, wherein said calibrating circuit comprises a constant current source selectively connected to each respective pixel.

20. (Previously Presented) The image sensor according to claim 19, wherein an output node is associated with each photodiode, and wherein the linear and logarithmic output signals are derived from the output node, said calibration circuit further comprising a switch connected between said photodiode and the output node for isolating said photodiode from the output node while calibration takes place.

21. (Currently Amended) An image sensor comprising:
an array of pixels, each pixel comprising
 a photodiode,
 a first output circuit connected to said
photodiode for generating an output signal to be a
linear output signal, said first output circuit
comprising
 a reset switch for applying a reset
voltage to said photodiode, said reset switch

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comprising a reset transistor including a
conducting terminal connected to said photodiode,
and

a readout switch for turning on the
conducting terminal of said reset transistor, said
readout switch comprising a readout transistor
including a conducting terminal connected to the
conducting terminal of said reset transistor, and
including a control terminal,

a second output circuit connected to said
photodiode for generating the output signal to be a
logarithmic output signal by reading a near
instantaneous illumination-dependent voltage on said
photodiode that is a logarithmic function of the
illumination, said second output circuit comprising

an amplifier including an output and at
least one input connected to the conducting
terminal of said reset transistor, and

a log select switch for connecting said
amplifier to said photodiode, said log select
switch comprising a log select transistor
including a pair of conducting terminals connected
between the output of said amplifier and the
control terminal of said readout transistor at-
least one input of said amplifier, and including a
control terminal to receive a log select signal,
said first and second output circuits sequentially

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providing the linear and logarithmic output signals;
and

an output selection circuit coupled to said array of pixels for selecting between the linear output signal and the logarithmic output signal as the output signal.

22. (Previously Presented) The image sensor according to Claim 21, wherein the linear output signal is selected if the pixel has not saturated during generation of the linear output signal, otherwise, the logarithmic output signal is selected.

23. (Previously Presented) The image sensor according to Claim 21, wherein said first output circuit derives the linear output signal by applying a reset signal to said photodiode and reading a voltage on said photodiode after an integration time.

Claims 24-26 (Cancelled).

27. (Previously Presented) The image sensor according to Claim 21, wherein said amplifier comprises a differential amplifier so that the at least one input includes an inverting input connected to the conducting terminal of said reset transistor, and a non-inverting input connected to a reference voltage.

28. (Previously Presented) The image sensor according to Claim 21, further comprising a calibration circuit for calibrating each pixel before deriving the logarithmic output

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signal.

29. (Previously Presented) The image sensor according to Claim 28, wherein said calibrating circuit comprises a constant current source selectively connected to each respective pixel.

30. (Previously Presented) The image sensor according to Claim 29, wherein an output node is associated with each photodiode, and wherein the linear and logarithmic output signals are derived from the output node, said calibration circuit further comprising a switch connected between said photodiode and the output node for isolating said photodiode from the output node while calibration takes place.

31. (Currently Amended) A method for operating an image sensor comprising an array of pixels, each pixel comprising a photodiode, the method comprising:

deriving a linear output signal from each pixel using a first output circuit comprising a reset switch for applying a reset voltage to the photodiode, the reset switch comprising a reset transistor including a conducting terminal connected to the photodiode, and a readout switch for turning on the conducting terminal of the reset transistor after expiration of an integration time, the readout switch comprising a readout transistor including a conducting terminal connected to the conducting terminal of the reset transistor, and including a control terminal;

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deriving a logarithmic output signal from each pixel using a second output circuit by reading a near instantaneous illumination-dependent voltage on the photodiode that is a logarithmic function of the illumination, the second output circuit comprising an amplifier including an output and at least one input connected to the conducting terminal of the reset transistor, and a log select switch for connecting the amplifier to the photodiode, the log select switch comprising a log select transistor including a pair of conducting terminals connected between the output of the amplifier and the control terminal of the readout transistor ~~at least one input of the amplifier~~, and including a control terminal to receive a log select signal;

sequentially providing the linear and logarithmic output signals; and

selecting between the linear output signal and the logarithmic output signal as an output signal.

Claims 32 and 33 (Cancelled).

34. (Previously Presented) The method according to Claim 31, further comprising calibrating each pixel before generating the corresponding logarithmic output signal.

35. (Previously Presented) The method according to Claim 34, wherein each pixel is calibrated by applying a constant current thereto.

36. (Previously Presented) The method according to

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Claim 35, wherein an output node is associated with each photodiode, and wherein the linear and logarithmic outputs are generated with respect to the output node, and a calibration circuit comprising a switch is connected between the photodiode and the output node for isolating the photodiode from the output node while calibration takes place.